GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3132908

Semester – III
Subject Name: STATISTICS FOR TEXTILE ENGINEERING

Type of course: Basic Science

Prerequisite: Basic knowledge of subjects like mathematics and statistics.

Rationale: Knowledge of Statistics tool is one of the important steps to control/improve quality of textile material / process for any textile engineer.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	2	0	5	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Basic Statistics for Textile materials/processes:** Field of Statistics, Collection of Data for textile material or process, Population and sample, Graphical representation of data, types of distribution curves, Measure of central tendency - Mean, Median and Mode, Partition values – Quartiles, Deciles and Percentiles.	4
2	**Measurement of Dispersion of Textile raw materials, intermediate products and processes.** Dispersion – Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Range, Coefficient of Quartile Deviation, Coefficient of mean Deviation, Coefficient of Variation, Variance.	4
3	**Skewness and Kurtosis related to Textile mill data** Skewness around AM, Symmetric frequency distribution, Skewed frequency distribution, Measures of Skewness – Karl Pearson's coefficient of Skewness and Bowley's Coefficient of Skewness, Kurtosis, Measures of kurtosis.	4
4	**Correlation and Regression of Industrial data.** Types of Correlation, Measure of correlation – Scatter Diagram and Karl Pearson's Coefficient of Correlation, Coefficient of determination, Spearman's Rank Correlation Coefficient, Line of Regression analysis.	6
5	**Basic of Probability & Probability Distribution of textile data.** Experiment, Definition of probability, Laws of probability, Binomial probability distribution, Properties of Binomial distribution, Poisson probability distribution, Properties of Poisson distribution, Normal probability distribution, Properties of Normal distribution, Chi-square probability distribution, properties of Chi-square distribution,	4
6	**Sampling Methods to collect data for textile material and Determination of Number of test** Types of sampling methods – Probability and Non-Probability, Number of Test for assessment of	2

	quality of textile product & its impacts.	
7	**Application of Statistics for textile data.** Formation of Hypothesis, Test of significance for Small samples: t- Test for single mean, difference of means, t-test for correlation coefficients, F- test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.	**6**
8	**Control Charts to control quality of textile product / processes.** Introduction and Significance of Control Chart, Control Charts for Variable (X-bar and R Chart), Control Charts for Attributes (p, n p, c charts)	**2**
9	**Planning of textile Experiment using Design of Experiment (DOE)** Use of DOE, Guideline for designing of experiment, Classification of Design of Experiment, Two level and three level factorial design.	**4**
10	**Use of Analysis of Variance for Interpretation data collected from experiment.** One way ANOVA and Two way ANOVA,	**6**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	**28**	**35**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. J. R. Nagla., "Statistics for Textile Engineers", Woodhead Publication India Pvt Ltd.
2. J. Hayavadana., "Statistics for textile and Apparel management", Woodhead Publication India Pvt Ltd.
3. Introduction to Statistical Quality Control by Douglas C. Montgomery published by John Wiley & Sons, Inc.
4. Principles of Textile Testing - J.E.Booth published by CBS Publishers & Distributors
5. Statistical Techniques in Spinning Mills by T.V.Ratnam published by South India Textile Research Association, Coimbatore
6. Leaf, G. A. V., Practical Statistics for the Textile Industry-Part I & II, The Textile Institute, UK, 1987.
7. Dhillon, B. S., Applied Reliability and Quality: Fundamentals, methods, and Procedures, Springer, London, 2007.
8. Bowker, A.H., and Liberman, G.J., "Engineering statistics", Prentice Hall, N.J.1972
9. Murray P Spiegel, "Theory & Problems of Probability & Statistics"
10. Ray and Sharma, "Mathematical Statistics"
11. Bhattacharya, G.K., and Johnson, R.A.," Statistical concepts and methods", John Wiley, New Delhi, 2002
12. Hogg, R.V, Elliot, A.T., "Probability and Statistical Inference", Pearson Education, 6th Edition

13. J. N. Kapur, H. C. Saxena., "Mathematical Stastics", S Chand and Company Limited, New Delhi.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the centre tendency, correlation and correlation coefficient and also regression.	25
CO-2	Understand significance of dispersion for textile material / process.	20
CO-3	Understand the probability distribution.	10
CO-4	Apply statistics for testing the significance of the given large and small sample data by using t- test, F-test and chi-square test.	20
CO-5	Understand the significance of DOE, its calculation and interpretation of ANOVA	25

Tutorial Exercise:

1. Calculate Mean, Median, and Mode using textile data.
2. Calculate Range, Mean Range and Percentage Mean Range using Textile data.
3. Calculate Mean Deviation, Percentage Mean Deviation of textile material / Processes.
4. Numerical based on Standard Deviation, Coefficient of Variation, Variance
5. Determination of Number of sample test for assessment of any textile raw material or its product.
6. Find Normal Distribution, Binomial Distribution etc. of textile mill data.
7. Calculate Karl Pearson's coefficient of correlation, Rank correlation coefficient and lines of regression for textile material/processes.
8. Numerical based on probability of textile data.
9. Produced Variable Control Charts of textile data,
10. Numerical based on Attribute Control Charts
11. To design the textile experiment for given factor and level combinations by different using different DOE methods.
12. Numerical based on one way ANOVA.
13. Numerical based on two way ANOVA.

Major Equipment: NA

List of Open Source Software/learning website: http://nptel.iitm.ac.in, World Wide Web, Google Search Engine etc.